Thank

(1) Given $W_{air} = 0.2$ kg ; $W_{water} = 0.1$ kg (1.n)

$W_{liquid} = 0.12$ kg

$$\text{specific gravity} = \frac{W_{air} - W_{liquid}}{W_{air} - W_{water}} = \frac{0.2 - 0.12}{0.2 - 0.1}$$

$$= \frac{0.08}{0.1} = 0.8$$

(2)

$W_{air} = 90\,gm$ $d_{brass} = 9\,gm/cc$; $d_{water} = 1\,gm/cc$

we know $$S.G = \frac{W_{air}}{W_{air} - W_{water}}$$ also $$S.G = \frac{d_{body}}{d_{water}}$$

$$\Rightarrow \frac{9}{1} = \frac{90}{90 - W_{water}} \quad 10$$

$$\Rightarrow 90 - W_{water} = 10 \Rightarrow W_{water} = 90 - 10 = 80\,gm$$

(3)

Given $W_{air} = 200\,gm$; $W_{liquid} = 180\,gm$

$W_{water} = 175\,gm$ $d_{water} = 1\,gm/cc$

we know $$S.G = \frac{W_{air} - W_{liquid}}{W_{air} - W_{water}} = \frac{200 - 180}{200 - 175}$$

$$\Rightarrow \frac{d_{body}}{d_{water}} = \frac{20}{25}$$

$$\rightarrow d_{body} = \frac{20}{25} \times d_{water} = \frac{4}{5} \times 1 = 0.8\,gm/cc$$

$$= 800\,kg/m^3$$

(4)

Given $W_{air} = 200$ gm ; $W_{water} = 175$ gm.

Relative density $= \dfrac{W_{air}}{W_{air} - W_{water}}$

$$R.D = \frac{200}{200-175} = \frac{200}{25} = \underline{8}$$

(5)

Given $W_{air} = 24$ gm ; $W_{water} = 21$ gm

Specific gravity of liquid $= 1.1$

We know specific gravity $= \dfrac{W_{air} - W_{liquid}}{W_{air} - W_{water}}$

$$\Rightarrow 1.1 = \frac{24 - W_{liquid}}{24 - 21}$$

$$\Rightarrow 1.1 = \frac{24 - W_{liquid}}{3}$$

$$\Rightarrow 3.3 = 24 - W_{liquid} \Rightarrow W_{liquid} = 24 - 3.3$$

$$= 20.7 \text{ gm}$$

(6)

Volume of liquid $= 1$ lit ; specific gravity $= 0.7$

$$S.G = \frac{d_{body}}{d_{water}}$$

$$\Rightarrow 0.7 = \frac{d_{liquid}}{1 \text{ gm/cc}}$$

$$\Rightarrow d_{liquid} = 0.7$$

$$\Rightarrow \frac{mass}{volum} = 0.7$$

$$\Rightarrow mass = 0.7 \text{ lit}$$

$$\Rightarrow mass = 0.7 \times \cancel{1000}$$

$$= 7\cancel{00}$$

weight $= mg = 0.7 \times 10$

$= 7$ N.

(7)

$W_{air} = 60$ gm.

Specific gravity $= S.G = 0.6$

Tension in thread = loss of weight of the sphere.

$= W_{air} - W_{liquid} = 55$ gm wt

~~Spe~~ specific gravity of liquid $= \dfrac{W_{air} - W_{liquid}}{W_{air} - W_{water}}$

$$\Rightarrow 0.6 = \frac{60-55}{60-W_{water}} \Rightarrow 0.6 = \frac{5}{60-W_{water}}$$

$$\Rightarrow 60 - W_{water} = \frac{5}{0.6} = \frac{50}{6}$$

$$\Rightarrow W_{water} = 51.6$$

$\therefore$ Specific gravity of sphere $= \dfrac{W_{air}}{W_{air} - W_{water}}$

$$\Rightarrow \frac{60}{60-51.6} = \frac{60}{8.4} = 7.2$$

(8)

Apparent weight = constant

$$mg - F_B = \text{constant}$$

$$\Rightarrow mg\left[1 - \frac{d_L}{d_b}\right] = \text{constant}$$

$$\Rightarrow m_{lead}\, g\left[1 - \frac{d_L}{d_{Lead}}\right] = m_{iron}\, g\left[1 - \frac{d_L}{d_{iron}}\right]$$

$$\Rightarrow m_L\left[1 - \frac{1}{11}\right] = 8\left[1 - \frac{1}{8}\right]$$

$$\Rightarrow m_L\left[\frac{10}{11}\right] = \cancel{8}\left[\frac{7}{\cancel{8}}\right]$$

$$\Rightarrow m_L = \frac{77}{10} = 7.7 \text{ gm}$$

Given $m_{air} = 10\,N$; $w_{water} = 6\,N$.

$w_{liquid} = 8\,N$

⑨ Specific gravity of liquid $= \dfrac{w_{air} - w_{liquid}}{w_{air} - w_{water}}$

$$S.G = \frac{10-8}{10-6} = \frac{2}{4} = \frac{1}{2} = 0.5$$

⑩

Here forces acting on cork

→ buoyant force [thrust] ↑ ⇒ $F_B = \rho V (g-a)$

→ weight ↓ ⇒ $w = \rho V g$

'a' acceleration of elevator

V → volume of cork, ρ → density of water.

As elevator accelerates downwards, effective value of g i.e. $(g-a)$ decreases i.e. F_B also decreases

This results there is a less upward force acting on the cork, so the spring will not need to exert as much force to keep the cork submerged.

As a result the length of the spring increases it will stretch more to accommodate the reduced buoyant force.

(11)

Given $W_{air} = 15N$ $W_{water} = 12N$

Relative density of block $= \frac{W_{air}}{W_{air} - W_{water}} = \frac{15}{15-12}$

$= \frac{15}{3} = 5$

Relative density of liquid $= \frac{W_{air} - W_{liquid}}{W_{air} - W_{water}}$

$= \frac{15-13}{15-12} = \frac{2}{3}$

(12)

Given

Area $A = 4\ cm^2 = 4 \times 10^{-4}\ m^2$

length $l = 60\ cm = 60 \times 10^{-2}\ m$; $d_{solid} = 1500\ kg/m^3$

$d_{water} = 10^3\ kg/m^3$

upthrust $= \rho_L V_{in}\, g = 10^3 \times A \times l \times g = 10^3 \times 4 \times 10^{-4} \times 60 \times 10^{-2} \times 10$

$= 2.4\ N$

weight of solid $= \rho_{solid} V g = 1500 \times 4 \times 10^{-4} \times 60 \times 10^{-2} \times 10$

$= 60 \times 10^{-2} \times 6$

$= 3.6\ N$

(13)

According to Archimedes Principle, the weight of the floating body is equal to weight of the liquid displaced

The apparent weight = weight of the body − weight of liquid displaced

The body float when both the weights are same. In this case, when the body is floating, the apparent weight is zero

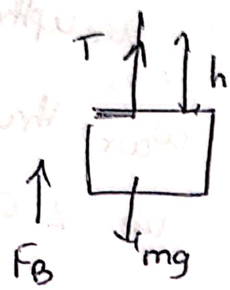
(4)

(15), (16)

Given $L = 0.6\,m$; mass $= 450\,kg$; $d_{liquid} = 1030\,kg/m^3$

Area of block $= L^2 = (0.6)^2 = 36\times10^{-2}\,m^2$

Here Top of the Block is at a depth $h = \frac{L}{2}$ from surface.



Pressure due to liquid $= P_{atm} + \rho g h$

$= 10^5 + 10^3 \times 10 \times (\frac{L}{2})$

$= 10^5 + 10^3 \times 10 \times \frac{0.6}{2}$

$\Rightarrow 10^5 + 10^3 \times 3$

$\Rightarrow \cancel{300}\ 103\times10^3\,N/m^2$.

Force $=$ Pressure $\times$ Area

$\Rightarrow 103\times10^3 \times 36\times10^{-2} \Rightarrow 1030\times36$

$\Rightarrow 37080 = 3.7\times10^4\,N$

Total upward force $= \rho_{Liquid} \times V_{in} \times g$ $\quad (V_{in} = A \times \frac{3L}{2})$

$\Rightarrow 1030 \times L^3 \times g = 1030 \times (0.6)^3 \times 10 \times \frac{3}{2}$

$= \cancel{2237.6} \quad \cancel{2.23\times10^3\,N}$

~~Force = up~~

$= 222.48 = 2.25\times10^3$

$T + F_b = mg$

$\Rightarrow T + 2.25\times10^3 = 450\times10$

$\Rightarrow T + 2.25\times10^3 = 0.45\times10^4 = 4.5\times10^3$

$\Rightarrow T = 4.5\times10^3 - 2.25\times10^3 = 2.25\times10^3\,N$

(18)

$W_{air} = a$ $W_{liquid} = b$.

Decrease in weight of body = upthrust.

= upthrust

Reading of A in fig-III → W_{air} - thrust = a - thrust

$< a$

Reading of B in fig III → up thrust

fig IV → up thrust

Task

CUQ's

(3)

No Buoyancy force in vacuum.

(4)

clearly Buoyant force is more in case of sea water because of it's high density, hence, the boat rises when it goes from river to sea.

(8)

Since density of cotton < density of Iron, so 100 kg of cotton will occupy more space than 1 kg iron, hence displace more volume of air. Since upthrust is directly proportional to volume of fluid displaced, cotton will experience more upthrust $\therefore R_1 > R_2$

$\therefore$ Apparent weight of iron > cotton., hence it will feel hea

Given $W_{air} = 24\,gm$, $W_{water} = 21\,gm$

(1) specific gravity of liquid $= \frac{4}{3}$

we know that $S.G = \frac{W_{air} - W_{liquid}}{W_{air} - W_{water}}$

$$\Rightarrow \frac{4}{3} = \frac{24 - W_L}{24 - 21} \Rightarrow \frac{4}{\cancel{3}} = \frac{24 - W_L}{\cancel{3}}$$

$$\Rightarrow W_L = 24 - 4 = 20\,gm.$$

(2)

Given $W_{brass\ air} = 180\,gm$: $d_{br} = 9\,gm/cc$

$d_{water} = 1\,gm/cc$

$$\text{specific gravity} = \frac{W_{air}}{W_{air} - W_{water}}$$

$$\Rightarrow \frac{d_{br}}{d_{water}} = \frac{180}{180 - W_{water}}$$

$$\Rightarrow 9 = \frac{\cancel{180}\ 20}{180 - W_{water}} \Rightarrow 180 - W_{water} = 20$$

$$\Rightarrow W_{water} = 180 - 20 = 160\,gm$$

(3)

$W_{air} = 0.4\,kg$; $W_{water} = 0.2\,kg$; $W_{liquid} = 0.22$.

$$\text{specific gravity of liquid} = \frac{W_{air} - W_{liquid}}{W_{air} - W_{water}}.$$

$$= \frac{0.4 - 0.22}{0.4 - 0.2} = \frac{0.18}{0.2}$$

$$= \frac{1.8}{2} = 0.9$$

(4)

$d_{alcohal} = 0.8$ gm/cc. $\quad V_{raised} = 20$ cm

$$F_B = \rho_{Liquid} V_{in}\, g = 0.8 \times 20 \times 1000 = 16\ldots$$

$$= 0.16N.$$

(5)

$Vol = 400\ m^3 \quad M_{balloon} = 34$ kg

$d_{H_2} = 0.09$ kg/m3, $\quad d_{air} = 1.3$ kg/m3

upward force = ~~force~~ weight of balloon without gas

$$d_{air} Vg = m_b g + d_{H_2} Vg + m'g.$$

$$\Rightarrow 1.3 \times 400 = 34 + 0.09 \times 400 + m'$$

$$\Rightarrow 520 = 34 + 36 + m'$$

$$\Rightarrow m' = 450 \text{ kg}$$

(6)

$V_{in} = \frac{4}{5} V.$; Relative density = 0.8.

where V = volume of block.

we know Relative density = $\frac{W_{air}}{W_{displaced}} = \frac{d_b}{d_w}$

$$\Rightarrow R.d = \frac{\rho \cancel{V} \cancel{g}}{\rho_w \cancel{V_{in}} \cancel{g}} \Rightarrow d_b = R.d \times d_w$$

when body floats

$$W_{body} = W_{liquid\ displaced}$$

$$\Rightarrow \rho_b \times V = \rho_L \times V_{in}$$

$$\Rightarrow R.d \times d_w \times \cancel{V} = \rho_L \times \frac{4\cancel{V}}{5}$$

$$\Rightarrow 0.8 \times 10^3 = \rho_L \times \frac{4}{5} \Rightarrow \rho_L = 10^3 \text{ kg/m3}$$

Scanned with OKEN Scanner

$w = 2m$; depth $= 1.5m$; $l = 4m$.

S.G of block $= 0.7$

volume $= l \times b \times w = 2 \times 1.5 \times 4 = 12 m^3$

when body floats

weight of body = weight of liquid displaced

$$R.d = \frac{d_b}{d_w} \Rightarrow d_b = R.d \times d_w$$

$$\Rightarrow 0.7 \times 10^3$$

$$\Rightarrow 700 \ kg/m^3$$

9, 10

$W_{air} = 49.05 N$; $W_{water} = 19.62 N$.

$$\text{Specific gravity of stone} = \frac{W_{air}}{W_{air} - W_{water}} = \frac{49.05}{49.05 - 19.62}$$

$$= \frac{49.05}{29.43} = 1.66$$

$W_{air} \Rightarrow mg = 49.05$

$$\Rightarrow m = \frac{49.05}{g} = \frac{49.05}{10} = 4.905 \ kg.$$

$d_{stone} = S.G \times d_{water} = 1.66 \times 10^3$

$$\text{volume} = \frac{\text{mass}}{\text{density}} = \frac{4.905}{1.66 \times 10^3} = 2.95 \times 10^{-3}$$

$$= 3 \times 10^{-3} = 0.003 m^3$$

Given

(14), (15), (16), (17)

Area $= 4\times10^{-4}\ m^2$; $l = 0.3\ m$

$d_{alcohol} = 780\ kg/m^3$; $d_{solid} = 1500\ kg/m^3$.

ω: weight of solid $= \rho V g = \rho_{solid}\, A \times l \times g$

$= 1500\times4\times10^{-4}\times0.3\times10$

$= 180\times10^{-2} = 1.8\ N$

$\cancel{\text{upthrust} = \text{weight of liquid displaced}}$

$\cancel{= \rho_{liq} V_{in}\, g}$

$\cancel{= 780\times4\times10^{-3}\times0.3\times10}$

$\cancel{= 78\times12\times10^{-2}}$.

Apparent weight of the body in water $= \rho_w V_{in}\, g$
upthrust

$= 10^3\times4\times10^{-4}\times0.3\times10$

$= 1.2\ N$

Apparent weight of the body in water $= 1.8 - 1.2 = 0.6\ N$

Apparent weight of the body in alcohol $= \omega - \rho_{alc} V_{in}\, g$

$= 1.8 - 780\times A\times l\times g$

$= 1.8 - 780\times4\times10^{-4}\times0.3\times10$

$= 1.8 - 78\times1.2\times10^{-2}$

$= 1.8 - 93.6\times10^{-2}$

$= 1.8 - 0.936$

$= 0.864\ N$.

18

Given $w_{air} = 0.25$ kg f ; volume = 7.5×10^{-5} m3

$\therefore$ density $= \frac{m}{v} = \frac{0.25}{7.5 \times 10^{-5}} = 0.0333 \times 10^{5}$

$= 3333.3$ kg.

weight $= mg = 0.25 \times 10 = 2.5$ N.

loss of weight $= \rho_{\omega} V g = 10^{3} \times 7.5 \times 10^{-5} \times 10$

$= 0.75$ m^3